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HYDROPHILIZATION OF SOLID SURFACES

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Fogging on the windshields of vehicles of all kinds when they are wetted with water, for example rain, is an unpleasant phenomenon. This fog formation has its origin in the deposition of hydrophobic dirt, so that water does not wet the windshield. The scattering of light produced by the nonwetting reduces visibility drastically, which is a safety risk.

The hydrophobic dirt can be removed with powdered agents that have a large surface area. Such agents are, for example, silica, kaolin, chalk and the like. The initial good result, however, is ruined after a short time by the further deposits of hydrophobic substances.

The addition of surface-active cleaning agents has also been attempted, but it only has the effect of removing coarser dirt more easily.

The hydrophobization of the windshield in a carwash through the use of water-soluble cationic agents as "water displacers" to shorten the drying time after washing, which belongs to the prior art, gives rise to the formation of fog on the windshield and a considerable degree of poor visibility when the vehicle is subsequently driven over rainy streets.

It has been known since dishwashing machines have come into use that spot free drying of the dishware after the wash cycle is not achieved. In spite of the use of surface-active compounds as the so called clear rinse agents white, spot-like deposits remain behind. They result from the fact that in the end the water becomes distributed on the surface of the dishes in the form of drops and the water hardeners in the water are deposited at these sites.

It is known that aggressive laboratory cleaning agents like chromosulfuric acid, among others, have to be used to degrease burettes, etc., in order to guarantee flawless runoff of aqueous solutions on the walls.

It was now found that all of the described disadvantages caused by hydrophobic dirt and/or cationic compounds on solid surfaces when they become wet with water or aqueous solutions can be avoided if the solid surfaces are treated in accordance with the invention with an aqueous solution of a cationic polyelectrolyte. Possibilities as cationic polyelectrolytes are polymer ethyleneimines, polymer dimethylaminoethyl methacrylate or acrylate or mixed polymers of the said substances with nonionic monomers like acrylamide, acrylonitrile, etc., or derivatives of these compounds. The substances listed as examples do not limit the object of the invention. The polyelectrolytes can expediently be used in a concentration from 0.001 to 40% in the form of aqueous solutions. The water-soluble polyelectrolytes in accordance with the invention can be used by themselves but they can also be used in combination with nonionic surfactants and/or hydroxyl compounds.

The invention is substantiated further by means of the following examples.

Example 1

25 mL of a 0.5% aqueous solution of polytrimethylammoniumchloroethyl methacrylate with molecular weight of about 1,000,000 is added to a 1-L windshield washer unit. With this solution the windshield washer produces a jet of water that does not break up even when there is a strong headwind and that is drawn by the windshield wiper over the windshield to form a clearly transparent cohesive viewing sector.

Example 2

A 1-L windshield washer unit was filled with a 1% solution of a cleaning and hydrophilization agent of the following composition:

50 parts polytrimethylammoniumethyl methacrylate (40% in water), M_w about 50,000

10 parts monononylphenol polyglycol ether (with 9 ethylene oxide units)

6 parts ethanol

34 parts water

The effect is the same as in Example 1 except that the windshield dries clear after stopping the wiper.

Example 3

A 1-L windshield washer unit was filled with a 1% solution of a cleaning and hydrophilization agent of the following composition:

50 parts polytrimethylammoniumethyl methacrylate (40% in water), M_w about 50,000

10 parts mononononylphenol polyglycol ether (with 14 ethylene oxide units)

7.5 parts polyalkylene oxide with about 60% ethylene oxide and 40% propylene oxide

32.5 parts water

A completely fog free completely transparent white surface that dried clear after stopping the wiper was achieved.

Example 4

9 test tubes were treated with a cationic hydrophobizing agent that is customarily used in carwashes and thoroughly rinsed with tap water. The water was no longer able to wet the glass wall.

a) Test tubes 1-3 were shaken with a 1% solution of 9-etononylphenol for 5 minutes and again vigorously rinsed with tap water. After this the water film immediately broke up and formed drops.

b) Test tubes 4-6 were shaken with a 1% polytrimethylammonium chloride ethyl methacrylate solution. After that hydrophilization of the glass could clearly be recognized; however, the water film still broke up here and there.

c) Test tubes 7-9 were briefly shaken with a 1% solution as in Example 2. Then they were immediately rewetted with water and could be hydrophobized no further. The wetability continued to be maintained even after rinsing 10 times with tap water.

Example 5

A burette, on whose inside wall the water ran off in beads, was treated with a 1% solution as in Example 3. Then it was washed again several times with pure water. After that the water ran off uniformly without the formation of drops.

Example 6

A dishwashing machine was loaded with a commercial detergent. A supply of 0.5 aqueous solution of polytrimethylammonium chloride ethyl methacrylate (M_w about 1,000,000) was added to the clear rinse dispenser.

The rinsed glasses and plates exhibited absolutely spot free high gloss after drying.

Example 7

6 test tubes were hydrophobized as in Example 4 and then 3 test tubes were retreated as in Section 4c except that a 4% solution of the following cleaning and hydrophobization mixture was used:

67 parts polyethyleneimine solution (40%, M_w about 50,000), 10 parts mononononylphenol polyglycol ether (with 9 ethylene oxide units)

10 parts nonylphenol polyglycol ether (9 ethylene oxide)

6 parts ethanol

1 part acetic acid

34 parts water

Wetting again occurred immediately and continued to exist even after rinsing 10 times with tap water.

Publications taken into consideration:

FEY: "Chemical Industrial Rules Collection" Stuttgart 1952, p 102

DT Patent 1 255 837

DT Auslegeschrift Patent 1 139 229

Claims

1. Hydrophilization of solid surfaces, which is characterized by the fact that they are treated with aqueous solution of a cationic high molecular polyelectrolyte.

2. Hydrophilization of solid surfaces as in Claim 1, which is characterized by the fact that the cationic polyelectrolyte is used in aqueous solutions in a concentration from 0.001 to 40%.

3. Cleaning and hydrophilization of solid surfaces, which is characterized by the fact that nonionic surfactants and/or hydroxy compounds and/or polyalkylene glycols are added to the cationic polyelectrolytes.